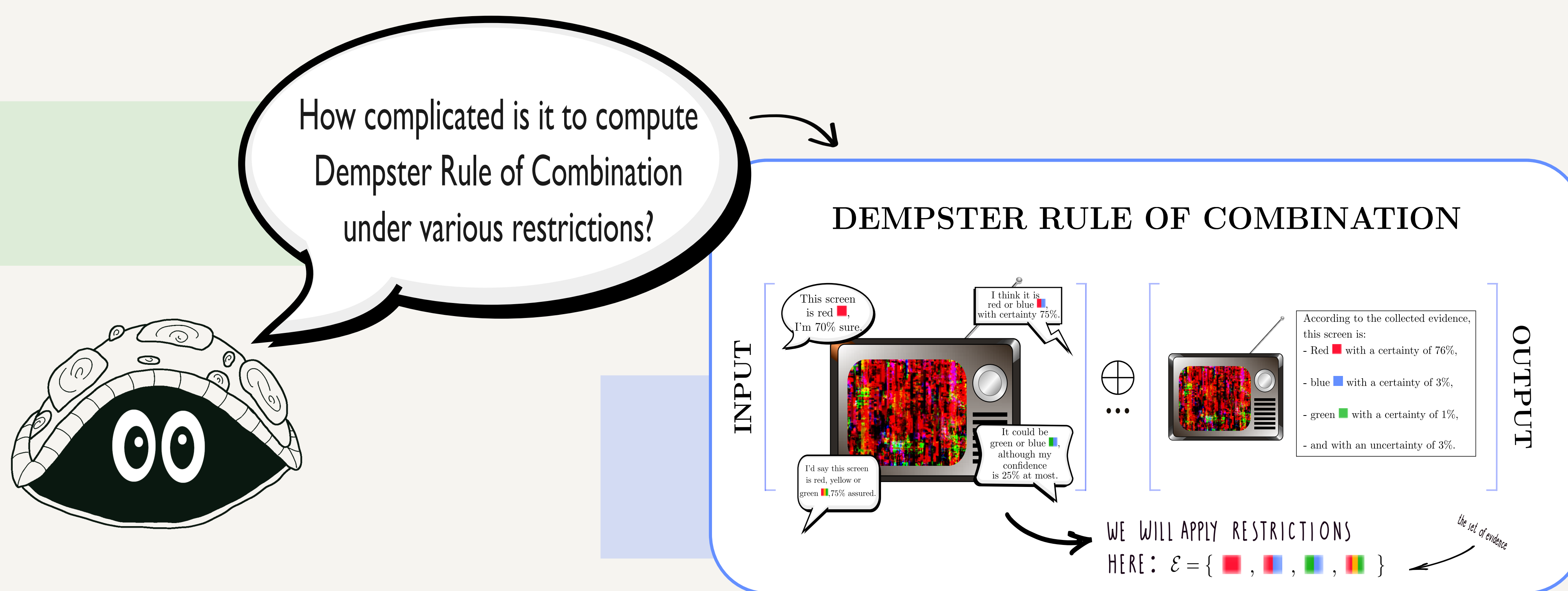


UNCERTAIN EVIDENCE COMBINATION

Computational complexity analysis*



#P-HARD

P

Problem: DRC-COMPUTE-MASS
Restriction: General case

(Orponen, 1990)

$$\mathcal{E} = \{\text{red}, \text{blue}, \text{pink}, \text{yellow}, \text{blue}, \text{red}, \text{green}, \text{blue}, \text{pink}, \text{yellow}, \text{red}, \text{green}\}$$

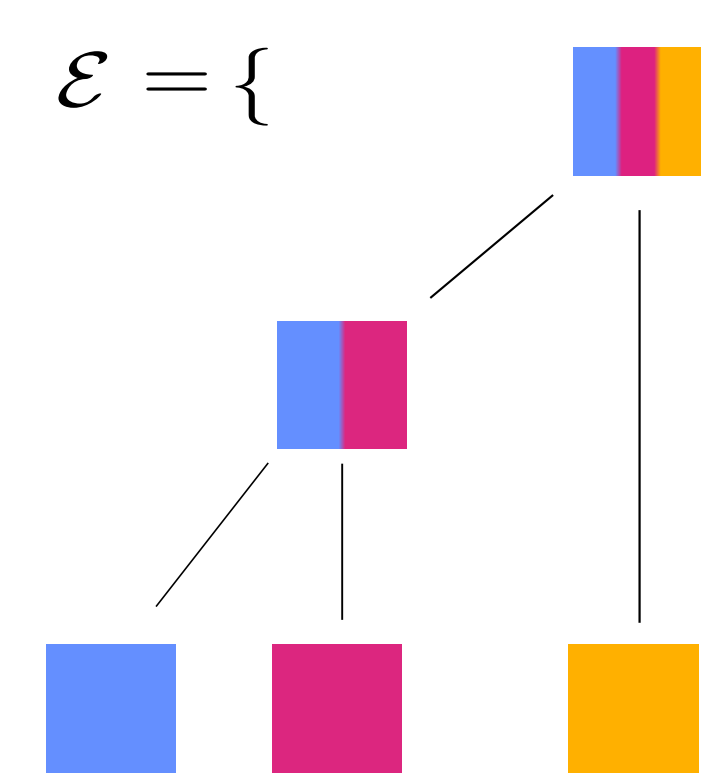
Definition. [Hierarchy]

A set $\mathcal{E} = \{C_1, \dots, C_n\}$ of pieces of evidence is a *hierarchy* if and only if for all C_i and $C_j \in \mathcal{E}$ it holds that:

if $C_i \cap C_j \neq \emptyset$,
then $C_j \subseteq C_i$ or $C_i \subseteq C_j$.

Problem: DRC-COMPUTE-MASS
Restriction: Hierarchical set of evidence

(Shafer and Logan, 2008)



Problem: HIERARCHY (Deciding whether the set of evidence is a hierarchy and computing it)
Restriction: General case

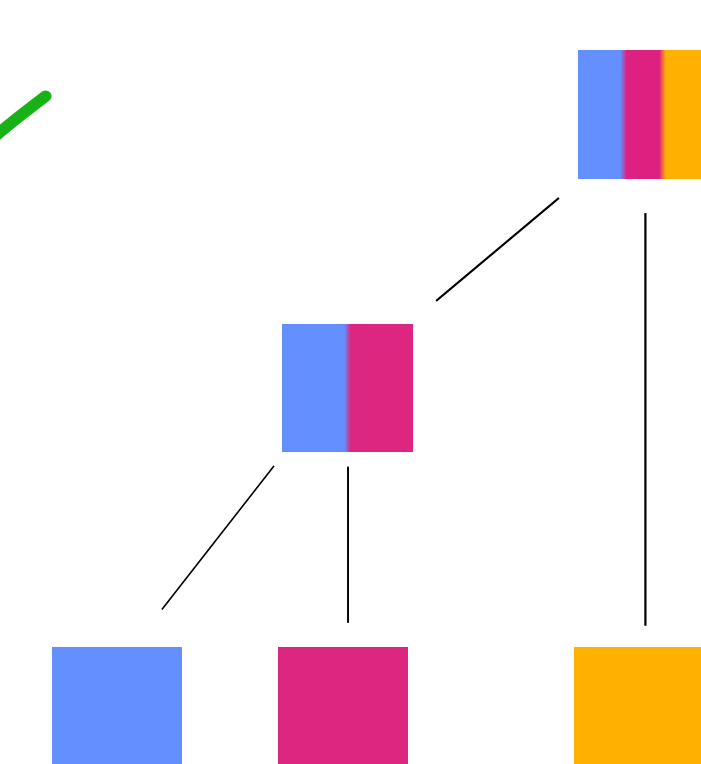
$$\mathcal{E} = \{\text{red}, \text{blue}, \text{green}, \text{yellow}\}$$

$$\mathcal{E} = \{\text{blue}, \text{pink}, \text{yellow}, \text{blue}, \text{pink}\}$$

$$\text{red} \cap \text{green} = \text{blue}$$

but

$$\text{red} \not\subseteq \text{green} \quad \text{green} \not\subseteq \text{red}$$

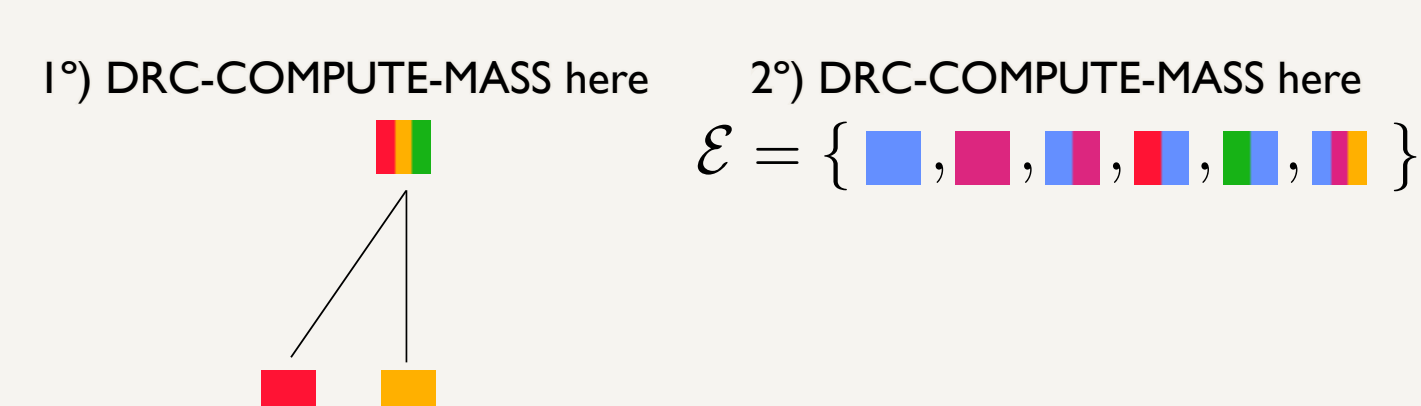


FIXED PARAMETER TRACTABLE

Problem: DRC-COMPUTE-MASS
Restriction: General case

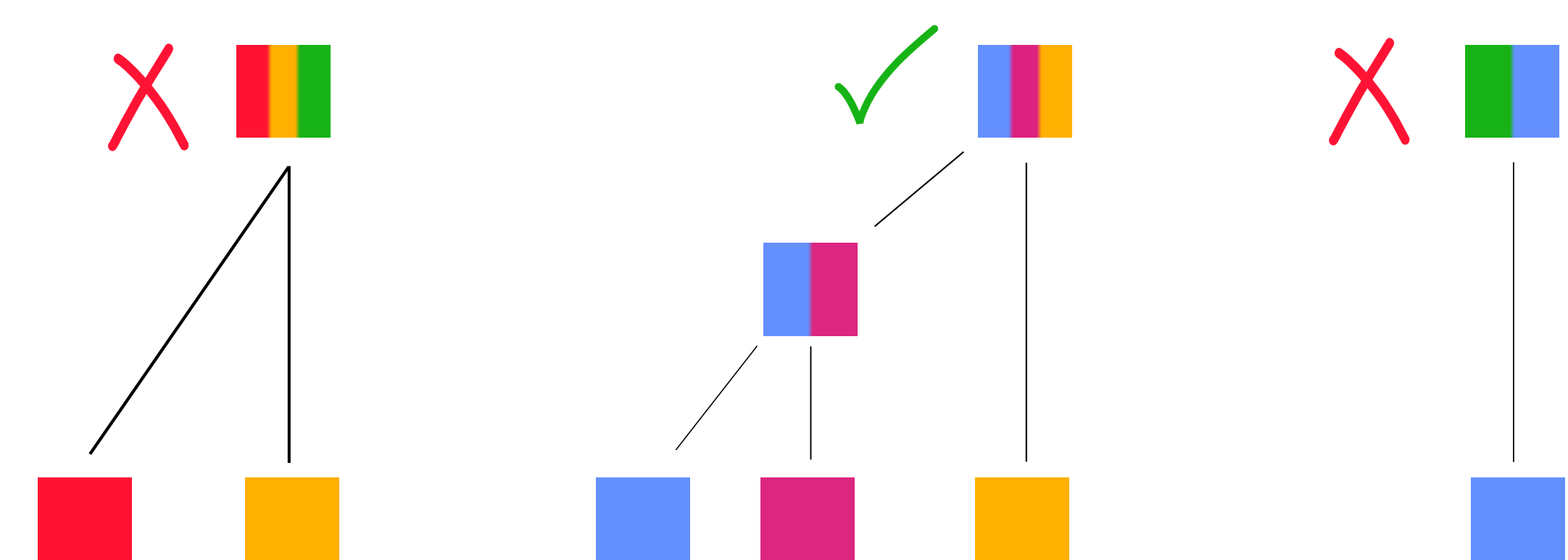
$$\mathcal{E} = \{\text{red}, \text{blue}, \text{pink}, \text{yellow}, \text{blue}, \text{red}, \text{green}, \text{blue}, \text{pink}, \text{yellow}, \text{red}, \text{green}\}$$

We defined an algorithm which takes advantage of the hierarchies within the set of evidence



Problem: PARTIAL-HIERARCHY (Finding the largest hierarchy)
Restriction: General case

$$\mathcal{E} = \{\text{red}, \text{blue}, \text{pink}, \text{yellow}, \text{blue}, \text{red}, \text{green}, \text{blue}, \text{pink}, \text{yellow}, \text{red}, \text{green}\}$$



*Using Hierarchies to Efficiently Combine Evidence with Dempster's Rule of Combination